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Computer Program Calculates Sonic-Boom Pressure Signatures

The problem:

The sonic boom, which only a decade ago was an interesting but little recognized and little understood physical phenomenon, has now emerged as a major concern in the operation of present military airplanes and poses one of the most serious operational problems to be encountered in the development of commercial supersonic transports. Detailed knowledge of sonic-boom overpressure dependence on configuration geometry is necessary for operational planning and for the development of design methods to minimize the annoyance.

The solution:

In recent years, theoretical studies have resulted in the development of estimation methods which have been generally substantiated in correlations with wind-tunnel and flight data for the steady-state case of constant Mach number and altitude.

How it's done:

A programed computational method, based on the modified linear theory analysis of G. B. Witham, allows the calculation of sonic boom characteristics of airplane configurations for a range of flight conditions. Inputs to the program are a distribution of airplane cross-sectional area obtained through the employment of supersonic area rule concepts and a

distribution of equivalent cross-sectional area due to lift evaluated through an integration of the lifting force per unit length along the airplane longitudinal axis. Program inputs are conveniently provided by companion programs. One program developed for wave drag evaluation provides the area distribution, and another program developed for determination of wing aerodynamic characteristics provides the equivalent area due to lift. Program outputs are the complete near field (or far field) pressure signature, including shock wave strengths and locations.

Notes:

1. This program was written in Fortran IV to run on an IBM 7094 computer with the IBSYS Version 13 operating system and library tape.
2. Inquiries concerning this program may be directed to:

COSMIC
Computer Center
University of Georgia
Athens, Georgia 30601
Reference: B67-10489

Patent status:

No patent action is contemplated by NASA.
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